value Ip1). After the generation of electric discharge has been detected and the first pulse width T1 has passed, the switching element, which has been turned on before, is turned off by the control means 14, and the switching element in the group of switching elements 13, which is connected in series with a resistor of low resistance in the group of resistors 16, is turned on, so that the electric discharge current can be increased (the second peak value Ip2). Then, after the second pulse width T2 has passed, all the switching elements in the group of switching elements 13 are turned off by the control means 14. Further, after the recess time Tr has passed, the switching element in the group of switching elements 13 is selectively turned on again by the control means 14. When the above operation is repeated, electric discharge surface treatment is conducted. As described above, the peak value of the electric discharge current can be controlled by selectively turning on and off the switching element in the group of switching elements 13 by the control means 14.

The electric discharge current pulse may be like a step as shown in Fig.1B. Alternatively, the electric discharge current pulse may be like a slope as shown in Fig.1C. The electric discharge current pulse can be increased like a slope by the method in which inductance is inserted in series into the electric power circuit of the

electric power unit for electric discharge surface treatment.

Figs.2A to 2C are schematic illustrations showing the circumstances of formation of a hard coat on a workpiece by electric discharge surface treatment in which an electric power unit for electric discharge surface treatment of an embodiment of the present invention is used. In the drawing, reference numeral 1 is an electrode, reference numeral 2 is a workpiece, reference numeral 10 is an electric discharge arc column, and reference numeral 17 is a hard coat formed on the workpiece 2 by the method of the present invention. Fig.2A shows a state corresponding to the first portion of the first pulse width T1 shown in Fig.1B or 1C. Fig. 2B shows a state corresponding to the last portion of the first pulse width T1 shown in Fig. 1B or 1C. Fig.2C shows a state corresponding to the second pulse width T2 portion shown in Fig.1B or 1C.

In Fig. 1B or 1C, the first pulse width T1 and the first peak value Ip1 are set so that the electric current density can be in a predetermined range to suppress the emission of electrode material (Fig.2A), and the diameter of the electric discharge arc column 10 is sufficiently extended in the range of the first pulse width T1 (Fig.2B). Next, under the condition that the diameter of the electric discharge arc column 10 is extended, the group of switching

elements 13 are controlled by the control means 14 so that a quantity of supply of hard coat material by the emission of electrode material can be a predetermined value according to a predetermined processing condition in the second pulse width T2, and the electric discharge current is increased to the predetermined second peak value Ip2. In this way, the hard coat 17 can be effectively formed on the workpiece 2 as shown in Fig.2C.

Concerning the setting values of the first pulse width T1 and the first peak value Ip1 by which the electric current density between the electrodes can be in a predetermined range to suppress the emission of electrode material, and also concerning the setting values of the second pulse width T2 and the second peak value Ip2 by which a quantity of supply of hard coat material to the workpiece can be a predetermined value, the setting values are previously found by experiments. Therefore, those values can be set according to a predetermined processing speed, a state of the surface of the hard coat and a processing condition such as a quantity of consumption of the electrode.

For example, data such as a quantity of consumption of the electrode for electric discharge surface treatment, a state of the surface of the hard coat formed on the workpiece and a productivity of the surface treatment work